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Supporting Complex Problems: An Examination of Churchman's Inquirers as a Knowledge Management Foundation

Abstract

This paper examines current knowledge management research through the lens of Churchman's inquiring systems. These inquiring systems are ideal foundations from which to view knowledge management and its associated research because knowledge creation and organizational learning are critical elements of knowledge management. Churchman proposed that organizations should support knowledge creation and learning through emphasis on problem structure and appropriate inquiring strategies. This paper discusses the characteristics of Churchman's inquirers, the problem structure for which they are most appropriate, and presents examples of each. Then, examples of previous research that share characteristics of the most complex inquirers are discussed. Organizational benefits from the inquiring system approach and guidelines for future research are suggested.

Keywords: Knowledge based systems, knowledge management practice, philosophy, Churchman's inquirers

Background

From early in its existence, information system design has sought to provide technological support for management decisions. The management information systems of the 1970s were designed to aggregate data into useful reports for effective control of the organization (Grover and Davenport, 2001). As information systems proved their value in simple process automation, new organizational systems were designed to facilitate executive decision-making (e.g., decision support systems and executive information systems). The requirements and complexity of information systems continue to evolve as information systems mature. Organizational learning and knowledge management are among the more complex processes of interest to designers and researchers.

Underlying both of the processes above is concept of problem recognition and formulation; organizations need better ways to control the process of discovering and handling problems (Millet, 2005). The design and use of information systems to support these complex processes, particularly knowledge management, is one of the most dynamic research fields today. Advanced information systems (intranet, extranet, data mining, etc.) can be used to systematize, enhance, and expedite large scale knowledge management (KM) projects (Alavi and Leidner, 2001). Additionally, the use of collaborative technologies such as groupware is much more common in organizations providing necessary infrastructure for the social concepts required by knowledge management. Data mining, databases, electronic bulletin boards, knowledge directories, and expert systems are all examples of supporting information technologies potentially available in a comprehensive KM system (Alavi and Leidner, 2001).

A KM system requires more than the creation and sharing of knowledge; it is also necessary to conceptualize a system that aids decision-making (Hall et al., 2003) and can focus on addressing complex, unstructured (wicked) problems (Mason and Mitroff, 1973).

These types of problems incorporate many modern management decision domains that appear overwhelmingly wicked (Raffia, 1968) or ill-behaved (Mason and Mitroff, 1973). Further, Courtney (2001) posits that globalization will lead to increasingly wicked problems for all types of organizations and that methods are needed to facilitate effective decisions in such situations. KM, with its focus in unstructured and moderately unstructured problems, should assume the role of facilitating these types of decisions.

In a broad-reaching work on information systems, Churchman (1971) described information systems as inquiring systems based on the work of five influential western philosophers. He conceptualized five types of inquiring systems designed to promote inquiry in the course of knowledge creation and decision-making. Each type of system uses different strategies for information discovery and application in the course of problem solving. Managers need information systems that present evidence for all of the types of problems the organization faces because today's tumultuous environment often requires rapid responses in uncertain environments (Mason and Mitroff, 1973). A KM system, like other information systems, should aid information discovery to support decision-making, particularly in complex situations (Hall et al., 2003).

Knowledge Management and Complex Problems

Information systems have evolved dramatically and have enhanced our ability to identify issues and apply relevant knowledge (Millet, 2005). From their initial application of automating routine administrative tasks, to more complex systems of today, information systems have supported the organization with mixed results. Thirty years ago, almost all information systems activities were directed toward structured decisions, although most areas of greatest concern to managers are moderately to fully unstructured (Gorry and Scott Morton, 1971). While organizations of the past certainly faced many unstructured decisions, today's organizations are finding themselves competing in increasingly complex

environments. Turbulent economics, fast-paced technological changes, and a need to compete in a global environment have increased overall problem complexity. To be able to survive and ultimately succeed in this environment, organizations must be increasingly cognizant of threats and opportunities while becoming more adept and efficient in their response to them.

As problems become increasingly unstructured in the today's challenging organizational environment, it is critical for KM systems to effectively address these wicked problems. Several aspects of these problems have been examined both through specific research and through broad-reaching frameworks. However, knowledge management is a much broader concept that incorporates not only information technology, but also examines processes and people to coordinate the transformation of an organization from reactive to proactive.

An organization is most effective when applying different inquiry processes as appropriate for the task at hand (Hall and Croasdell, 2005). KM systems support this process by adding flexibility to the decision-making and problem-solving environment by maintaining knowledge on structured decisions made in the past, organizational experiences, explicated tacit knowledge, and directories of expertise. While inquiry is critical to problem solving, organizations must also strive to incorporate knowledge management into their corporate vision and strategy. When KM processes align with organizational strategy, decision makers are not only better able to quickly respond to opportunities and threats, but are also able to do so in a way that guides strategic processes. Such processes require that KM systems contain specific knowledge creating technologies such as learning and collaborative centers to support communities or networks of practice, thus allowing an organization to not only reflect on its past but to better define its future.

An organization's ability to create new knowledge is regarded as a primary source of competitive advantage today and will increase in the future. Developing processes to actively support the process of organizational knowledge creation is an activity that should be prioritized (Roth, 2003; Stenmark, 2003). Organizational learning has been one of the foundations of KM systems since the initial research in the topic. However, it is not enough to be cognizant of the need for learning. Rather, today's organizations must apply a multitude of knowledge building processes to achieve its goals; each of these processes depends largely on the structure of the problem it faces.

Problem Structure and Churchman's Inquirers

Problem structure is an area where properly designed and utilized information and KM systems can provide support for both organizational learning and knowledge management, but is often an area overlooked by traditional information systems with a structured, decision-focused orientation. Many traditional systems focus on alternative selection and, to a much less degree, on the process of identifying variables that fit into a predefined model structure such as a simple spreadsheet or a more complex optimization model. This implies not only that the available models are appropriate, but that the assumptions underlying those models are applicable. While often adequate under conditions of little uncertainty, information systems must also be able to provide support when problems are ill-structured. Solutions for such problems may need to be constructed or synthesized from new combinations of existing knowledge with new information, rather than simply derived from existing data sets.

Inappropriate problem formulation leads to an inability to apply existing relevant organizational knowledge to the problem. Thus, not only does decision-making effectiveness suffer but the organization fails to learn as efficiently as it could. These consequences may be critical in today's business environment where competitive advantage is often based on an

organization's ability to react quickly and appropriately to changing situations. Problem structure, therefore, is a critical aspect of knowledge management system design.

The role of information systems in problem solving can be classified as to the degree of structure in the problem; the degree of difference between the classifications is how much of the decision can be automated, i.e. structured, versus the degree to which the human decision maker must provide judgment and insight into the problem, i.e. unstructured (Gorry and Scott Morton, 1971). Examples of structured decisions include dividends, purchasing, and billing; semi-structured decisions include forecasting, budgeting, and assignments; and unstructured decisions include e-commerce, career paths, and grievances (Courtney, 2001).

How an organization responds to a given problem is dependent largely on the ability to recognize its structure. While routine (structured) problems are relatively easy to discern, many times moderately or fully unstructured problems appear to be structured until analysis reaches a depth at which missing or unavailable information is recognized. The process of inquiry that is used to formulate solutions may be tailored to the complexity of the problem by further dividing problem structure into a combination of structure and type. Most problems can be categorized by propensity for analytical solution, likelihood of conflict, or need for a consensual solution. These categories can be reviewed through the characteristic processes of Churchman's (1971) inquiring systems.

Inquiring systems are characterized by the properties of five inquirers described by Churchman (Courtney et al., 1998; Hall and Paradice, 2005; Mason and Mitroff, 1973). Churchman (1971) described five categories of inquirers based on the underlying philosophies of Leibniz, Locke, Kant, Hegel, and Singer. These inquirers share capabilities and can work together in a system designed to maximize both knowledge management and knowledge creation (Hall et al., 2003); they specifically support storage and retrieval of explicit information, organizational learning, and knowledge transfer (Hall et al., 2003).

The Leibnizian Inquirer

Information derived from models or proved from axioms is Leibnizian in nature (Mason and Mitroff, 1973). The Leibnizian inquirer is the most basic of the inquirers and provides the inquiring organization with its initial set of facts and axioms that comprise the foundation of organizational memory (Hall and Croasdell, 2005). A Leibnizian system uses its set of built-in elementary axioms with formal logic to generate more general facts or tautologies called fact nets. Typical systems that facilitate this inquirer are decision support systems and document management systems. The Leibnizian inquirer is best suited to structured problems. These problems would be characterized as having a solution and allowing for analytical formulation.

The Leibnizian inquirer is excellent for support in structured operational areas. One such area is the structured problem of transportation efficiency maximization. In this area, a problem exists when an organization must determine the most efficient transportation route for a new distribution center. In this scenario, the axioms would consist of existing, efficient routes. A candidate is developed about a route including mileage, traffic patterns, estimated man-hours, and current construction information. Additional information in the candidate would include wages and fuel costs. The candidate is then examined against the known efficient routes. If a candidate could have been derived using only the known efficient routes, it is deemed to be "true" and is placed in the fact net. The candidate placed in the fact net, is, by definition, an efficient route.

The Lockean Inquirer

The Lockean inquirer is a well-suited system for a relatively stable and highly social environment and is founded on principles of agreement embedded in classification of observations (Hall and Croasdell, 2005). Whereas in a Leibnizian system the networks are theoretically and deductively derived, in a Lockean system, they are empirically derived;

databanks and accounting are examples of Lockean systems (Mason and Mitroff, 1973). Empirical information, gathered from external observations, is used inductively to build a representation of the world. Typical systems that facilitate this inquirer are groupware and networks. The Lockean inquirer is best suited for structured problems where a strong consensual position is required.

By definition, a Lockean community shares common goals, beliefs, and values. Therefore, any problem considered by the Lockean community is one of a strong, consensual position. Conflict of any consequence does not exist because the goals of each member are the same, although the perception of the path necessary to attain the goal may differ between members. An example of a problem appropriate for a Lockean inquirer would be the definition of a 5-year plan. The external observation in this scenario would be the draft of the 5-year plan. Each committee member is sent the outline for the plan and is expected to determine whether that outline fits with the existing goals and missions of the organization (classified observations). If all members agree that the outline of the 5-year plan fits the organization's goals, the plan becomes part of the organization and is stored as a classified observation. If the plan does not meet with consensus among members, the committee chairman attempts to alleviate differences in order to reach consensus. If the decision-maker does not believe that consensus is possible, the plan would be disregarded at that point in time and be stored as an unclassified observation for later discussion. The Lockean inquirer clearly encourages and supports socially oriented knowledge development.

The Kantian Inquirer

Kantian systems are the archetype of multi-model, synthetic systems (Mason and Mitroff, 1973). The Kantian inquirer is designed to incorporate both multiple perspectives and facts to determine models that are appropriate for the situation (Hall and Croasdell, 2005) and incorporates multiple perspectives and an analytic process to create knowledge: it is

sensitive to the environment and attempts to apply the best fit answer to a problem. Each problem analysis will result in at least two alternative representations or models of the problem which elevates the Kantian system over both the Leibnizian and Lockean systems that provide only one view of the problem. The Kantian system is multi-perspective in its view representations; perhaps the most unique feature of Kantian systems is that the theoretical component allows an input to be subject to different interpretations. Typical systems that facilitate this inquirer are databases and model management systems. This inquirer is best suited for moderately unstructured problems that may not have a clear solution but still allow for analytical formulation.

An example of this type of problem is budgeting. The observation in this example is the bottom line of the budget, which becomes the candidate. The system will take the budget amount and draw on the existing historical cost information (axioms, fact net) to develop a series of budgets that can be derived from the historical cost information while maintaining the total budget amount. After each possible budget is determined, all budgets are reviewed in a statistical analysis module that determine which of the models provides the best fit of the data; i.e., the most efficient budget. The decision maker (e.g., the controller) will review the results of the statistical analysis and determine whether any model used in the system is generating poorly defined problem solutions. If so, the controller acts as the Executor and those models are disengaged. Models can be re-engaged at any time that the decision maker deems necessary.

The Hegelian Inquirer

The Hegelian inquirer is one of the more complex of the five inquirers (Hall and Croasdell, 2005). Like Kantian systems, Hegelian systems are multi-perspective, synthetic systems, but rather than a minimum of two representations, it constructs two antithetical representations of the problem (Courtney et al., 1998; Mason and Mitroff, 1973). Each of

these opposing views is examined in turn, and the strongest assumptions underlying each are synthesized into an overarching representation that, in effect, presents the best of both views. Hegelian systems function on the premise that greater enlightenment results from the conflict of ideas. Typical systems that facilitate this inquirer are repositories and negotiation systems. The Hegelian inquirer is best suited for unstructured conflictual problems.

An example of an appropriate problem for the Hegelian inquirer is one of wage resolution. In this scenario, the workers represent one Lockean community and management represents one Lockean community. Each side presents assumptions that support arguments that are in the interest of their respective community. These assumptions are compared to existing classified observations (e.g., rules, goals, or procedures of the organization). If the assumptions are found to be conflicting, the decision maker (e.g., an arbitrator) examines the conflicting pairs. For instance, consider the following two assumptions: workers are more satisfied and therefore more efficient when wages are competitive versus workers are more likely to work hard if they are dependent on hourly wages for sustenance. The system can present the decision maker with support for these examinations by running comparisons of each assumption against classified observations and presenting the results. If one of the assumptions is stronger than the other, the decision-maker adds that stronger assumption to the new (synthesized) view of the problem. This pattern is repeated until there are no more conflicting assumptions to compare. When all assumptions have been considered, the new broader view is assimilated into the synthesized fact net. In this manner, the decision-maker accepts the strongest arguments of both sides and each side can be considered to be victorious.

The Singerian Inquirer

The Singerian inquirer is the most complex inquirer; its primary purpose is to seek out inconsistencies throughout the organization and resolve the inconsistencies through a process

of measuring, partitioning, and refining (Hall and Croasdell, 2005); the very complexity that makes it suited to complex and unstructured problem domains makes it equally difficult to interpret. Singerian systems involve continual learning and adaptation through feedback (Mason and Mitroff, 1973). Two basic premises guide Singerian inquiry. The first premise establishes a system of measure that specifies steps to be followed in resolving disagreements among members of a community while the second premise is the strategy of agreement. Singerian inquiry provides the capability to choose among a system of measures to create insight and build knowledge (Courtney et al., 1998). The Singerian inquirer can be used to answer any of the problem types described above and may by facilitated by all systems, but is most appropriate for highly unstructured problems.

An example of a problem that can be addressed by a Singerian inquirer is that of promotion and tenure. Individuals on a promotion and tenure committee are members of the organization who, as a unified body, will make a decision regarding promotion or tenure of colleagues in the same organization. When an individual is presented to the committee for consideration, the members of the committee must first rate the individual against established criteria (measures) that exist as guidelines for the committee. Any disagreements between committee members than cannot be solved using existing measures are considered using additional variables. For instance, a requirement of the committee may be that the individual under consideration show active research and publication. However, members of the committee may disagree on whether the publications are of sufficient quality. If established measures fail to resolve the conflict, the committee may need to "sweep in" other variables to establish a new measure, such as the perceived quality of the individuals who publish in the same journals, or established rankings of various journals by outside organizations. Once the measure has been revised such that the disagreement is resolved, the process is replicated to provide support for the initial decision. If the outcome of the process is the same, it is

assumed to be valid, and the new measure is stored with existing measures (e.g., written guidelines regarding tenure and promotion review are revised to incorporate the new measure). If the outcome is not the same, the process is replicated until either the system cannot replicate the process or the outcome is replicated. If the system fails to verify the outcome with replication, the process of challenging the measures begins again. If the system is successful in its replication, the system will trigger a system accuracy check to verify not only the validity of the measure but also the reliability of the system. Table 1 summarizes the above discussion.

INSERT TABLE 1 ABOUT HERE

This discussion illustrates how the concepts that underlie Churchman's (1971) inquirers are important at all levels of organizational operations, and particularly important to organizations striving to move toward knowledge awareness. Understanding knowledge management practices, their relationship with organizational strategy, and the need to apply appropriate processes to different problem structures is critical for organizations as well as the researchers who investigate them. However, these relationships are rarely clearly defined in published literature.

General Overtones of Knowledge Management Research

Mason and Mitroff (1973) stated that the design of most if not all of MIS to date has been undertaken from the standpoint of Leibnizian and Lockean inquiry; the neglect of the other inquirers has been almost total due to the preoccupation of OR/MS with well–structured problems. While information systems have evolved significantly since their work, some may argue that information systems still have not been adequately deployed to assist in solving more complex problems such as those described above as moderately or fully unstructured. KM research has addressed this problem to a certain degree, although perhaps not directly in the domain of philosophically-based systems. By their very nature, KM systems seek to

apply organizational knowledge to unstructured problems. Using experts, organizational knowledge directories, and team enhancing technologies and processes, KM systems are focused on providing support for unstructured problem solutions of varying degrees.

Alavi and Leidner (2001) address decision-making and problems in several different contexts. Corporate directories may enable individuals to rapidly locate the individual who has the knowledge that might help them solve a current problem. A knowledge integration mechanism is the creation of self-contained task teams. Teams of individuals with prerequisite knowledge and specialty are often formed for solving unstructured problems. They note that while management reporting systems, decision support systems, and executive information systems have all focused on the collection and dissemination of explicit organizational knowledge, KM systems may provide an opportunity for extending the scope of information systems based knowledge provisions to handle different forms of knowledge.

Davenport and Prusak (1998) take a holistic view of KM's support of decision-making. What makes knowledge valuable to organizations is ultimately the ability to make better the decisions and actions taken on the basis of the knowledge. Evidence of the importance of problem structure is evident in the examples they present. For instance, General Motors (GM) has interviewed managers to learn what knowledge they use when making key decisions which, in the context of the example, is a decision based on a moderately or fully unstructured problem (Davenport and Prusak, 1998). 3M provides an example of the importance of knowledge transfer, particularly in complex problem domains such as product development; new ideas are often sparked by access to existing ones (Davenport and Prusak, 1998).

The frameworks discussed above are two of the most frequently cited articles in knowledge management research (Jennex and Croasdell, 2005). The concepts apparent in these frameworks define not only those in knowledge management, but also those underlying

Churchmanian systems. Other frameworks address different but related concepts. Becerra-Fernandez and Sabherwal (2001) proposed a contingency framework to examine the suitability of knowledge management processes based on two attributes of the organization's tasks: process or content orientation and focused or broad domain. Like problems, tasks can be categorized into different levels of structure. Holsapple and Joshi (2001) introduced a framework that identifies classes of knowledge resources that must be considered when examining systems for successful support of effective decisions, particularly those of an unstructured nature.

Generally, it appears from the above that problem structure, while often not directly addressed in research, is a critical element. This is also true for research that examines complexities such as multiple perspectives, conflict, and interdependence. These Churchmanian influences are examined but the underlying philosophy is unstated. Below, we describe extant KM research that combines problem structure and Churchmanian principles to show that they are an important, albeit relatively unspoken aspect.

Evidence of Knowledge Management Research Support of Churchman's Inquirers

A significant quantity of KM research has addressed many of the concepts defined by Churchman (1971) and subsequently conceptualized by others (Hall et al., 2003; Mason and Mitroff, 1973). This research has appeared in a variety of management and information systems journals; however, the current paper is not an inclusive examination of this work, but rather provides examples specific to Churchman's (1971) more complex inquirers. Given that other information systems are focused more extensively on structured problems, KM systems should facilitate decision making regardless of problem type but should concentrate on more complex problem domains. Structured domains represent the constructs of the Leibnizian and Lockean inquirers and are therefore not included in the examples below.

Rather, these articles are examples of Kantian, Hegelian, and Singerian inquirers and based on the moderately unstructured and unstructured problem types.

Kantian

The use of stories for sharing experiences and disseminating lessons learned is a well-known knowledge management practice. These can vary from unstructured stories to structured narrative techniques specifically intended to build organizational learning such as learning histories. Patterns complement these approaches. The elements of a pattern (context, problem, forces, solution, rationale, resulting context, related patters) allow readers to draw together a judgment as to its usefulness, appropriateness, and applicability in different contexts (May and Taylor, 2003). This research is an example of a Kantian inquirer where a repository would be used to access and store an organization's learning histories, and from that, develop differing representations of the problem.

Massey and colleagues (2002a) examine new product development (NPD) process at Nortel Networks. The NPD process is a highly knowledge-intensive endeavor based on the individual and collective expertise of employees. Another study of NPD in Nippon Telephone and Telegraph (NTT) examined how knowledge was created and integrated from knowledge around the world (Kodama, 2003). In this case, NTT combined existing technology to enter new markets. This is another type of moderately unstructured problem where some factors are fairly well defined but other factors are unstructured and thus an example of an area where Kantian inquires would prove useful by introducing appropriate processes to the technology already in place.

Multiple perspectives have been considered in other contexts than those above. The need to synthesize and/or support perspectives is evident in research on group support systems (e.g., Mark, 1997) and system development (e.g., Finkelstein et al, 1992). Other research has been conducted regarding multiple perspectives in the knowledge domain, such

as multiple perspective support systems (Janssen and Sage, 2000) and knowledge-based systems (Stolze, 1994). However, most of this work emphasizes synthesis of the perspectives rather than using the perspectives to represent information in a way that informs managers. Hegelian

Similar to product development, a study in product launch revealed that groups which use Group Support Systems (GSS) to support their activities produce a greater number of ideas/knowledge that prove more useful to managers making product launch decisions (Parent et al, 2000). These decisions are also moderately unstructured given the variability in product, price, location, and other factors pertinent to a product launch. While the multi-perspective characteristics of a Kantian inquire may be beneficial, it is likely that a negotiation between stakeholders will arise. For instance, management may prefer a low-cost launch, whereas commission-based salespeople would prefer a grand launch with which to generate immediate interest and increase sales potential. A situation such as this would be characterized as Hegelian, requiring the appropriate inquirer using a negotiation system to synthesize a solution with benefits to each side.

Hasan and Gould (2001) propose that cultural-historical-activity theory (CHAT) is appropriate for the unstructured decision-making environment of senior managers. CHAT provides a practical model of what people do, focusing on the relationship between the subject and object of an activity, a relationship mandated by tools and community; sense-making is the central activity to the problem of KM support for decision-making of senior managers. Given the complex nature of the problems described in this article, particularly given the often socially-constructed nature of the information being considered, conflict is likely to arise during the decision-making process. A Hegelian inquirer is an appropriate support component for this scenario and for CHAT generally.

In addition to the articles discussed above, there is much literature in negotiation and negotiation systems (e.g., Bose and Paradice, 1999; Lee, Chang and Lee, 2000; Lim and Benbasat, 1993; Swaab et al, 2002). While not directly approached as knowledge management research, it is obvious from the context that such research is an extension of Hegelian theory. What differs primarily from the intent of the Hegelian system, however, is that much of this research examines underlying differences to mediate, whereas the Hegelian Inquirer examines underlying assumptions of value to integrate. A second difference is that the Hegelian inquirer emphasizes the most opposing viewpoints to synthesize, thus examining the extremes of the context.

Singerian

Knowledge creation is one of the key factors in addressing unstructured and moderately structured problems. The knowledge creating process is specific to a particular context of time, space, and relationships with others (Nonaka and Toyama, 2003). These issues are all critical in understanding the nature of the problem. Research suggests that the seven factors critical to knowledge creation are: no-preconceptions principle, autonomy, serendipity, diverse stimuli, rich information provision, internal communication, and motivation (Stenmark, 2003). The specific factors critical to knowledge creation can be enabled by a corporate intranet. Of the factors listed above, no-preconception principle and rich information provision were the two creativity enabling conditions best matched by the specific characteristics of an intranet (Stenmark, 2003); however, policies in place to control intranets place restrictions on the process. Corporate intranets are likely to become useful only in organizations where management empowers the organizational members to design the information landscape. This empowerment is not only beneficial, but is a requirement of the Singerian inquirer, which routinely challenges the status quo and encourages examination by members of existing paradigms that may need changing.

Courtney (2001) proposed a new decision-making model for Singerian inquirers for decision support systems. The model emphasizes the need to consider many perspectives beyond the technical and has suggested ways to develop these perspectives. Support for the softer aspects of the decision such as the organizational, ethical, and aesthetic perspectives must be provided. The new decision-making environment paradigm for inquiring organizations calls for a greatly expanded view of decision support systems and knowledge management; this process focuses on developing multiple perspectives, the basis of the Singerian inquirer.

Massey and colleagues (2002b) propose a performance centered design (PCD) methodology for structuring knowledge intensive, ill-defined processes. PCD provides a holistic view of a performance environment by considered the complex interdependencies between the organizational context, business processes, and individual performers. Given the complex interdependencies described in this research, such a methodology would benefit from the characteristics of a Singerian inquirer. This inquirer is particularly adept at uncovering perceptual differences between individuals in relation to a given context, making it a natural fit for this methodology.

Markus and colleagues (2002) identified a class of design problems they called emergent knowledge processes. This class of problems has different processes, user, and knowledge requirements from those of semi-structured (moderately unstructured) decision supporting systems, a class of problems that is not adequately supported by existing systems such as DSS, groupware, etc. This is, however, the class of problem with which the Singerian system best interacts, making the inquirer a potential support component for emergent knowledge processes.

Zhuge (2003) presented an agent-based workflow model for distributed team cooperation for problem solving. While this work did not specifically address the structure of

the problem, it did focus on large problems requiring teams, generally a characteristic of a moderately unstructured or unstructured problem. The emphasis on teams, workflow, interdependency, and the need to work through contextual differences exemplifies a system that would benefit from the complexities of the Singerian inquirer.

Perhaps because of the level of complexity it incorporates, more knowledge management articles can be selected that investigate the principles behind the Singerian inquirer than either the Kantian or Hegelian inquirers. Some might argue that the Singerian inquirer is the ultimate knowledge management support technology, but each of the inquirers, even the most basic, has a place in a truly knowledge-enabled organization.

Implications and Conclusion

An inquiring organization is a learning-oriented organization that strives to include both creation and management of knowledge in its cache of core competencies (Hall and Croasdell, 2005). While easily said, such is not easily derived. Many factors are at work within organizations that may limit the effectiveness of such endeavors. Churchman's inquiring organization focuses on the process of inquiry and the nature of knowledge; it is a highly social organization with an understanding of social capital and corporate responsibility. Hoffman and colleagues (2005) suggest that social capital is a determinant of knowledge management capacity; Churchman would agree. Research based on investigating social capital would benefit from adopting one of the social inquiring systems (for instance, Lockean) as a lens through which to examine an organization. Managers who adopt an inquiring process such as the Lockean may be able to mitigate conflict and increase decision efficiency by building communities based on common understanding. Such a collaborative culture has been shown to influence both organizational learning and organizational effectiveness (Argyris and Schön, 1996; Churchman, 1971; Cross, Rice and Parker, 2001; Lopez, Montes Peon and Vazquez Ordas, 2004).

Focus on applying the most effective inquiry process given the nature of the problem is another possibility, both for managers and for researchers. Managers may learn to stress problem structure and basis over solution, a practice that has been shown to improve the breadth of alternatives and increase decision quality (Garvin, 1993; Keeney, 1992, 1999). Researchers may use one of Churchman's inquirers to focus on a particular type of problem to examine its effectiveness at improving the decision process. Such specialization of knowledge management systems during the decision process has been suggested by Nicolas (2004), who found that different types of knowledge management systems were more appropriate during different phases of decision-making. Likewise, different types of inquiring systems within the knowledge management process are most appropriate for specific problem types. However, it is not difficult to posit that different inquirers may also be appropriate during specific decision phases. For instance, the Kantian system may be particularly appropriate for the selection stage after alternatives have been defined.

This research has demonstrated, through several examples, that KM research is supporting inquiring systems as defined by Churchman (1971). The examples cited above are not meant to be inclusive, but instead to show examples of KM research that examines the complex problems facing organizations today. While early information systems focused somewhat more extensively on automating processes and assisting structured decision making, recent work in information systems, and particularly in KM, shows considerable support and capability for improving decision-making in moderately unstructured and unstructured decision environments.

Information systems must be centered on important decisions of the organization, many of which are relatively unstructured (Gorry and Scott Morton, 1971). Yet, to this day, many information systems have been primary engaged in working on structured problems. One could argue that many information systems have not lived up to the promise of support

for more complex problems. One possible cause of this would be the emphasis on a technological view of the problems while not adequately addressing the process implications in the organizations. Intentionally focusing KM research on the process of transformation toward a knowledge-enabled organization such as an inquiring organization may be a beneficial route for future research. An additional avenue of future research is to examine in much more detail the necessary cultural and process environments in an organization that will further facilitate effective use of Churchman's inquirers in designing effective information systems.

The research outlined in this paper shows the relationship between KM information systems, problem types, and Churchman's (1971) inquirers. It is the first to present evidence that an inquiring organization focus is not only appropriate for knowledge management research, but that extant research shows evidence of, and future research will benefit from the characteristics of inquiring system design. Significant amounts of resources have been invested in simple cost saving implementations of information systems. However, this work does not address the complex problems faced by organizations today. Without effectively focusing on the increasingly wicked, unstructured problems of the future, organizations will continue to use information systems to increase their efficiency while ignoring the more significant problems that information systems should address. By focusing research through the lens of Churchman's inquiring systems, and applying the philosophies underlying those systems throughout the organization, the envisioned complex management of problem structure, knowledge creation, and learning may be realized.

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Table 1- Overview of Churchman's Inquirers (Courtney, 2001; Hall et al., 2003)			
	Problem Type	**Examples of Supporting IT**	**Examples of Types of Problems**
Leibnizian	Structured, has a solution, allows for analytical formulation and structured representation)	Decision Support Systems, Document Management	Routing efficiency
Lockean	Structured, has a strong consensual position	Groupware, Networks	5-year plan
Kantian	Moderately unstructured, may not have clear solution, allows for analytical formulation	Databases, Model Management Systems	Budgeting
Hegelian	Unstructured, conflictual	Repositories, Negotiation Systems	Wage Resolution
Singerian	Structured, moderately unstructured, unstructured	Groupware, Networks, Repositories	Promotion and Tenure

Captions for Figures and Tables

1. Table 1- Overview of Churchman's Inquirers (Courtney, 2001; Hall et al., 2003)